B3.1 Gas exchange (HL)

What the Cell · DP Biology · worksheet · HL statements B3.1.11–13

Name _____ **Date** _____ **Total** _____ / 30

About 30 minutes, or one section at a time. The number of marks shows how many separate points to make.

Section A: Recall

7 marks

1 **Define** cooperative binding. B3.1.13 **[1]**

2 **State** the largest number of oxygen molecules one haemoglobin molecule can carry. B3.1.11 **[1]**

3 **State** the direction in which a rise in CO_2 shifts the oxygen dissociation curve. B3.1.12 **[1]**

4 **State** the direction in which the curve for foetal haemoglobin lies compared with adult haemoglobin. B3.1.11 **[1]**

5 **State** a typical partial pressure of oxygen in the alveoli. B3.1.13 **[1]**

6 **Outline** what is meant by the partial pressure of oxygen. B3.1.13 **[2]**

Section B: Understanding

12 marks

7 **Explain** why the oxygen dissociation curve of haemoglobin is S-shaped. B3.1.13 **[3]**

8 **Explain** why foetal haemoglobin must have a higher affinity for oxygen than adult haemoglobin. B3.1.11 **[3]**

9 **Explain** how a rise in carbon dioxide causes haemoglobin to release oxygen. B3.1.12 **[3]**

10 **Explain** how the Bohr shift benefits a muscle during hard exercise. B3.1.12 **[3]**

Section C: Working with evidence

7 marks

All data in this section are invented for practice. The patterns are realistic.

11 B3.1.11, B3.1.13

Llamas live high in the Andes, where the air in the alveoli has a pO_2 of about 6 kPa. The table shows the saturation of llama and human haemoglobin at different partial pressures of oxygen.

pO_2 / kPa	**1**	**2**	**4**	**6**	**8**	**13**
Human saturation / %	3	18	59	81	90	97
Llama saturation / %	7	33	76	91	95	99

a **Compare** the saturation of the two haemoglobins in the lungs of an animal at high altitude. **[1]**

b **Calculate** the fall in saturation of each haemoglobin as blood passes from lungs at 6 kPa to active muscle at 2 kPa. **[2]**

c **Explain** the advantage of llama haemoglobin at high altitude. **[2]**

d **Deduce** where the llama curve lies compared with the human curve. **[1]**

e **Suggest** one disadvantage of a haemoglobin with a high affinity for oxygen. **[1]**

Section D: Longer answer

4 marks

12 **Compare** the effect of foetal haemoglobin and the effect of high CO_2 on the oxygen dissociation curve. B3.1.11, B3.1.12 **[4]**

What the Cell. Original questions written for this course.